Paper Title: Technology Transitions and the Timing of Environmental Policy: Evidence from Efficient Lighting

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This project analyzes how the trajectory of clean technology development interacts with the type and timing of policies, using the market for efficient lighting to examine how incentivizing the deployment of earlier-generation clean technologies may inhibit the long-run transition away from dirty technologies. I build a theoretical model of competition between dirty technology and multiple generations of clean technology. Recognizing that policymakers often do not have access to the optimal Pigouvian tax for political economy reasons, I show how the efficient second-best policy, when policymakers are constrained to use technology-specific subsidies or standards, depends the arrival rate of the second-generation clean technology relative to the lifetime of the first-generation technology, the emissions rates of the different products, and the degree of substitutability between the clean technologies. In my empirical analysis, I examine competition between incandescent, halogen, CFL, and LED lighting technologies in the face of federal efficiency standards and state and local subsidies for efficient lighting. Using data at the UPC-store-week level over 2010 to 2017, I construct a structural model of lighting demand that accounts for endogenous coming-to-market, recognizing that varying technology lifetimes and preferences for efficient lighting meant that past purchases affected the size and characteristics of later consumers. I then simulate counterfactuals that vary the timing of standards and subsidies, reporting how welfare impacts of these second-best policies depend on their timing, the assumed lifetimes of early efficient lighting technologies (halogens and CFLs), and the rate of exogenous versus endogenous cost declines for later efficient technologies (LEDs). (250 words)